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SUMMARY REPORT ON MODELING ANALYSIS OF SELECTED POWER PLANTS IN 128 AQCRs FOR EVALUATION OF IMPACT ON AMBIENT SO2 CONCENTRATIONS, VOLUME II

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

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16. ABSTRACT

This report presents a summary of a series of 128 reports covering modeling analyses of 401 power plants distributed throughout 128 AQCRs in 44 states. The purpose of the study is to evaluate the impact on ambient SO_2 concentrations of power plant operations. This study provides a base for further analysis if decisions must be made regarding possible compliance extensions or fuel use options for power plants.

Volume I of this report covers the analysis of 195 power plants in 60 AQCRs by Walden Research Div. of Abcor, Inc. Volume II of this report covers the analysis of 206 power plants in 68 AQCRs by GEOMET, Inc.

This study is intended only to add to the overall analyses of the power plant industry being conducted both by governmental agencies and private industry. Decisions on final evaluations based on the material presented in this report pertaining to specific plants should consider the input data available for the model, the assumptions on which the model is based, the procedures followed in conducting the analysis, as well as several other factors not addressed herein.

17. KEY WORDS AND DOCUMENT ANALYSIS

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Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

June 1975

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ABSTRACT

This report presents a summary of a series of 128 reports covering modeling analyses of 401 power plants distributed throughout 128 AQCRs in 44 states. The purpose of the study is to evaluate the impact on ambient SO_2 concentrations of power plant operations. This study provides a base for further analysis if decisions must be made regarding possible compliance extensions or fuel use options for power plants.

A brief synopsis of the background for this study is presented in the introduction to this report. This is followed by a description of the analysis procedure and a presentation of the summary results.

Volume I of this report covers the analysis of 195 power plants in 60 AQCRs by Walden Research Division of Abcor, Inc. Of these 195 power plants modeled for 1972 operations, SO_2 emissions from approximately 20 resulted in concentrations which, by themselves, exceeded the primary 24-hour SO_2 standard. Volume II of this report covers the analysis of 206 power plants in 68 AQCRs by GEOMET, Incorporated. Of these 206 power plants modeled for 1972 operations, SO_2 emissions from approximately 54 resulted in concentrations which, by themselves, exceeded the primary 24-hour SO_2 standard.

Emissions from none of the plants for which an annual SO_2 prediction was obtained exceeded the primary annual SO_2 standard. Since for about 68 plants located in areas of high terrain, the model used estimated short-term concentrations only, no annual concentrations were predicted for those plants.

This study is intended only to add to the overall analyses of the power plant industry being conducted both by governmental agencies and private industry. Decisions on final evaluations based on the material presented in this report pertaining to specific plants should consider the input data available for the model, the assumptions on which the model is based, the procedures followed in conducting the analysis, as well as several other factors not addressed herein.

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The work reported in Volume II of this study was greatly aided by the technical direction of the EPA Project Officer, C.E. Mears, and the cooperation and assistance provided by D.H. Barrett, R.F. Lee, and A.G. Larson, all members of the Monitoring and Data Analysis Division of the Office of Air Quality Planning and Standards, Office of Air and Waste Management, EPA.

The GEOMET Principal Investigator was R.C. Koch. Members of the GEOMET staff who made significant technical contributions to the project include: E.R. Sawdey, P.H. Hwang, J.H. Beard, D.J. Pelton, C.A. Allen, and D.J. Moschandreas.

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I. INTRODUCTION

Recent developments in the energy field have necessitated review of state implementation plan requirements in the light of known or predicted shortages of oil and/or gas. In addition, the Energy Supply and Environmental Coordination Act (June 1974) requires certain analyses relating to power plant fuel use and the resultant impact on air quality. As a result, short-term modifications to plan requirements may be necessary to accommodate to the types and grades of fuel available; also, longer term alterations in fuel types and usage patterns may be required. These modifications may involve substitution of fuel types (e.g., coal for oil) or use of fuels with a higher sulfur content at selected power plants. In all cases, the modifications made should attempt to minimize the adverse impact on air quality and should assure the maintenance of primary air quality standards.

As the principal single user of fossil fuels, power plants offer the most expeditious means for accommodating to available fuels with minimum impact upon air quality. Thus, a systematic method to evaluate the air quality impact associated with various changes in fuels used by large power plants is required. Two previous studies performed by and for EPA have evaluated probable air quality impact for about 270 power plants* throughout portions of the United States which were considered primary candidates for fuel substitutions and associated plan modifications. Appendix A should be reviewed at this point to obtain an understanding of these previous studies. The purpose of the present study is to estimate the probable impact on annual and 24-hour SO_2 concentrations for 1972 operations at the remaining large power plants in the Nation. Volume I of this report outlines the analyses by Walden Research of 195 power plants in 60 AQCRs. Volume II outlines the analyses by GEOMET, Incorporated, covering 206 power plants in 68 AQCRs.

Although results have been reported for individual power plants, it is essential to understand the assumptions upon which the study was based and the limitations that must be adhered to when using modeling results for a particular power plant to assist in choosing a desirable course of action. Any decisions based on material presented in this report pertaining to individual plants should carefully and fully take into account the quality of input data available for the model, the assumptions on which the model is based, and the procedures followed in conducting the analysis.

The final evaluation for a given plant should consider all relevant data on the plant and should recognize the inherent limitations resulting from the data and procedures used in this modeling effort. Other factors which should be considered include: the impact of other sources in the area, projected growth for the region, measured air quality data, known or suspected downdraft or fumigation problems, unique nearby terrain features, nearby land use patterns and population distributions, more specific operational data for the plant, impact of units new since 1972, specific meteorological studies for the area, and additional studies or findings by other investigators. Only a full consideration of all these data will lead to a balanced and reasonable decision.

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* See list of references.

II. METHOD OF ANALYSIS

An overview of the method of analysis is presented by the flow diagram in Figure 1. This chart shows the relationship among the three major task elements and indicates further subtask components within each of these. Similar techniques and procedures were used both by GEOMET, Incorporated and by Walden Research, Inc. in their respective analyses of selected power plants.

A. SOURCE INPUT DATA

Data for the large power plants in the AQCRs studied were taken directly from the Federal Power Commission (FPC Form 67) and converted to the computer format required by the model. Base year data were obtained for 1972 operations. Adequate design and operating data for new units or new plants to be installed beyond 1972 were not generally available. However, the impact of such new units or new plants should be evaluated before any final action is taken on any specific plant.

Use of the FPC data base limits consideration to plants with a generating capacity of 25 megawatts (MW) or more which are part of a public utility system having a total capacity of 150 MW or more, since these are the only plants which have to file FPC Form 67. For certain AQCRs, the FPC requires that all power plants with a station capacity of 25 MW or more must be reported regardless of total system capacity. In general, this data base limitation is reasonable since plants smaller than 25 MW would have rated capacities no larger than many industrial boilers.

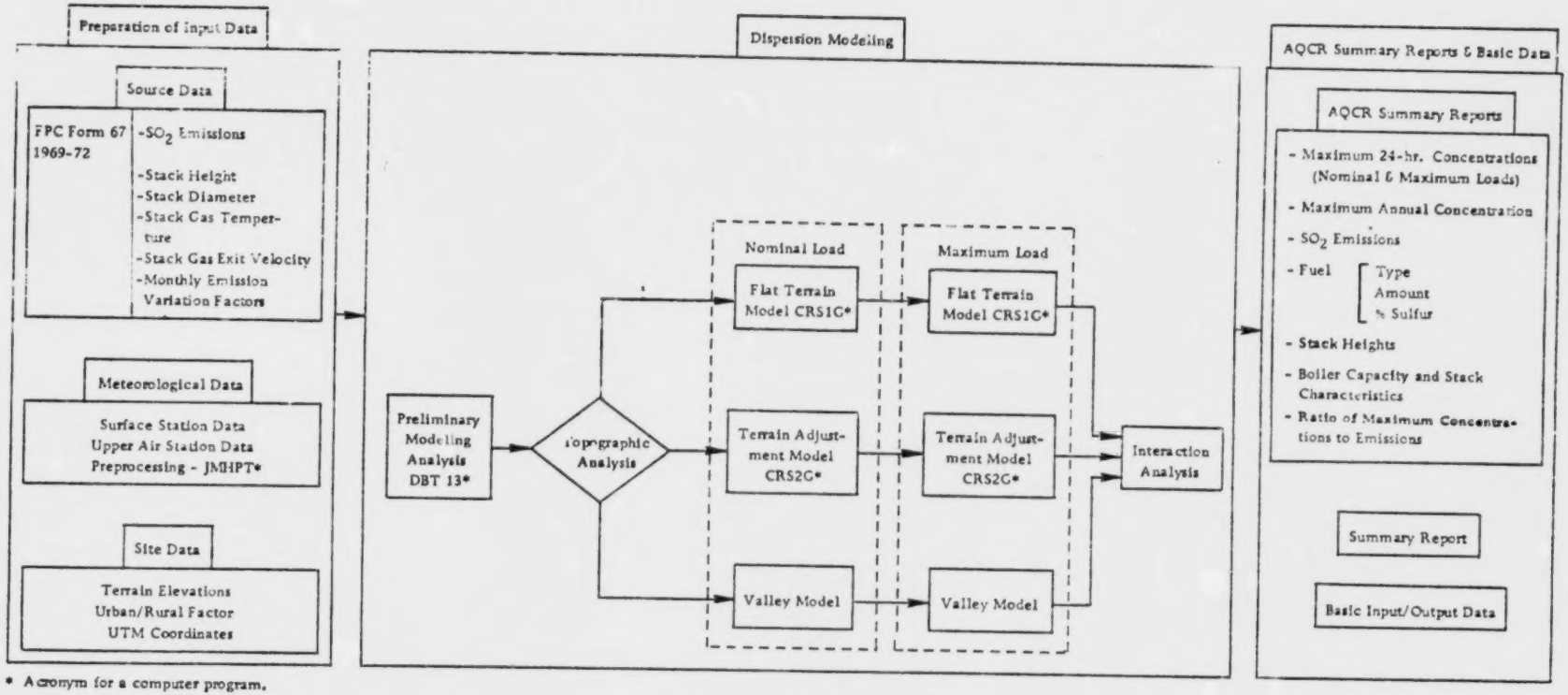
Source data required as input to the diffusion models include SO_2 emission rate, stack height, stack gas exit velocity, and stack gas temperature. Furthermore, the change in load demand with time of year is also input to the models.

The plant variation factors (refer to Appendix C) are a measure of the relative rate of emission for the entire plant for each month. Variations in total emission rate for the plant are influenced both by changes in power demand and by changes in the type of fuel being burned. The plant monthly variation factors are applied by the single source model to the emissions from each stack during the analysis for the days of each respective month. For plants analyzed with the valley model, the highest monthly variation factor during the year was used to obtain the modeled value.*

Several power plant units indicate the use of natural gas as a secondary fuel. However, where combustion of this natural gas in the quantities reported constituted negligible contributions to SO_2 emissions, it was not included in the analysis.

In the Walden analysis, in general, emissions from secondary fuels were included in the overall emission rate if they contributed more than 1 percent of the total emissions for that unit. The monthly variations of these fuels

* A discussion of the diffusion models applied to different plants is given on page 5.



* Acronym for a computer program.

Figure 1. Power Plant Modeling Analysis

were incorporated into the total plant variation if the emissions were greater than 10 percent of the total. In the GEOMET analyses, emissions from secondary fuels were included when those fuels amounted to 5 percent or more of total heat input during at least one month of the year. In both cases, monthly variations were determined on the basis of monthly emissions from each fuel calculated from fuel use and annual average sulfur content.

B. METEOROLOGICAL DATA

For an individual plant analysis, the meteorological data assembled consist of: (1) hourly surface weather observations in standard card image format, and (2) twice daily mixing height tabulations. The year 1964 was selected for the analysis because it is the only one which satisfies the dual requirement of hourly surface data, and wind direction azimuth recorded to the nearest 10 degree sector.

The surface and upper air data are preprocessed by a computer program (JMHPT). Among the different functions performed by this routine are:

- Screening of all data for completeness
- Determination of hourly stability classification
- Interpolation of twice daily mixing height data to hourly values.

The output of this preprocessing operation yields a set of meteorological data for input to the modeling analysis.

For plants analyzed with the valley model, no measured meteorological data were used in the calculations. The calculations for these plants were made for a representative unfavorable condition which is likely to occur, i.e., a stable atmosphere and a wind speed of 2.5 m/sec (see Appendix B).

C. SITE DATA

A principal site factor which can influence the impact on ground-level concentrations from power plant operations is the topography of the surrounding terrain. Isolated elevated terrain features such as nearby hills or bluffs can be severely impacted by plume transport along selected azimuth directions. In other locations, the power plant may be located in a valley with elevated terrain surrounding the plant site. Under certain conditions, lateral plume dispersion may be restricted by the valley walls.

The location of the power plant relative to urban areas also can influence the impact of plant operations on ambient concentration levels. Consequently, specification of the urban/rural characterization of the plant site location is an input parameter to the modeling analysis.

D. DISPERSION MODELING

For plants located in relatively flat terrain, a single source model was used to estimate both annual and 24-hour maximum SO_2 concentrations from each power plant, based on 1972 operations. This model was developed by the Meteorology Laboratory (NERC, RTP) of EPA. It employs a Gaussian plume formulation and Briggs' plume rise equation,* and uses hourly observations of meteorological conditions. Meteorological data were obtained from National Climatic Center records for the station judged most representative of conditions at each individual plant. A further description of the model is included in Appendix B. As applied herein, the model basically estimates 1-hour average SO_2 concentrations at a preselected field of receptors for each hour of the year from each power plant. The annual average concentration and the 24-hour average concentration (for each day) for each receptor are then calculated. Where interactions between power plants were significant, supplementary calculations were made to account for the impact of two or more facilities.

Where the topography showed surrounding terrain at significantly higher elevations than those of the plants, the modeling analysis considered this topographic factor by the application of a terrain adjustment procedure described in Appendix B.

In some cases, the topography at certain plant sites was above the calculated plume height for at least one stack at the plant. The analysis procedure considered this factor by the application of a special model designed to estimate maximum ground-level concentrations for elevated receptor sites in valley locations (EPA "valley model"). The general features of this model are also described in Appendix B. The scope of the analysis conducted with this special model was designed only to determine representative maximum 24-hour concentration levels. Because plume dispersion from power plants located in valley sites constitutes a complex interaction of source factors, terrain factors, and meteorological factors, a more detailed and exhaustive analysis of the specific power plant site is desirable prior to formulating any action on such a plant.

Since only power plant operations were being modeled and no other sources were considered, it was not possible to calibrate the model using measured air quality data. The calculated concentrations are considered to be reasonable estimates of ambient concentrations for the conditions simulated.

Modeling of power plant operations was conducted to determine air quality impact for 1972 operations. In many cases, the impact on air quality after a proposed conversion of a power plant (or part of a plant) to other fuels will be desired. The relationship between emissions and ambient air concentrations is dependent on source factors, meteorological factors, and local terrain effects. A change in plant operating conditions and emissions does not necessarily imply a directly proportional change in ambient concentrations. Therefore, additional detailed analysis must be undertaken if an estimate of the impact of the plant at different operating conditions is desired.

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* See list of references.

E. MAXIMUM LOAD VERSUS NOMINAL LOAD OPERATIONS

Emission data input to the single-source model is based on average monthly operations for each month of the year. Of course, the level of power plant operations varies from day to day; however, the FPC data are only available on a monthly basis. A power plant could quite possibly operate at near maximum rated capacity for 24 hours in many areas of the country. If such operations were coincident with the days of highest predicted concentrations, the model's maximum predictions could be significantly low.

Therefore, modeling results are presented in this report for two situations, as follows:

Nominal Load Case - This presents maximum concentrations calculated by the model based on average monthly emission rates.

Maximum Load Case - This case was calculated assuming the plant to be operating at 95 percent of rated capacity during selected days of highest concentration found by using the monthly average emission rates. Since the maximum load case involves a greater plume rise, a somewhat higher concentration may actually occur on a different day. To allow for this contingency, a 10 percent safety factor was added to the computed concentration.

For the same meteorological conditions, ground-level concentrations arising from nominal and maximum operating loads can be expected to differ, due to the joint effect of changes in emission rates, with corresponding changes in stack gas exit velocity and temperature. In addition, "worst case meteorological conditions" often vary with plant operating conditions. The specific interaction of these factors can produce higher concentrations under either nominal or maximum load conditions. Modeling of both cases provides a reasonable estimate of the range of possible values and permits identification of the maximum concentration case.

III. DISCUSSION OF RESULTS

This is the culmination of a series of three power plant modeling studies performed by and for EPA.. As a result of the current and two previous studies, modeling analyses have been carried out for every power plant which reported to the Federal Power Commission in 1972. The specific number of power plants which have been modeled for each AQCR in the Nation and the report which identifies them are listed in Table 1. Of the total of 670 plants, this volume deals with results obtained for 206 plants in 68 AQCRs which were modeled by GEOMET, Incorporated. Another 195 plants modeled in the current study by Walden Research are treated in Volume I. The remaining 269 plants were modeled in two previous studies as shown in Table 1.

AQCRs listed in Table 1 under the column labelled "51 AQCR Report" were modeled in initial studies by EPA and Walden Research to determine the impact of compliance extensions at 206 power plants in 51 AQCR's. The 63 power plants in 17 AQCRs which are listed under the column labelled "63 Coal-Conversion Plant Report" were subsequently examined for possible fuel conversion from oil to coal. Only plants identified at that time as candidates for coal conversion and neighboring interacting plants were considered in that study. Brief descriptions of these previous studies are given in Appendix A. Plants in AQCRs examined in the current study are listed under the column labelled "128 AQCR Study, Volume (I or II)."

When combined, the results of the three studies provide an overview of the impact of power plant operations on air quality. The results obtained for the power plants in each AQCR have been presented in separate reports, one for each AQCR. An individual AQCR report may be ordered from the Air Pollution Technical Information Center by specifying the exact title, AQCR name and number, and APTIC number associated with the report (see References). The format of these reports and a discussion of their content and interpretation is presented later in this section.

Table 2 lists the total number of plants modeled in each volume of the current study and indicates how many of these plants by themselves were found to exceed the 24-hour standard for SO_2 under either nominal or maximum load conditions. These findings were based on an analysis of 1972 operations, and do not account for pollutant concentrations from any source other than the individual power plant in question. It should be noted that these numbers do not include results previously obtained for many large coal- and oil-fired plants. The 54 plants modeled by GEOMET which by themselves exceeded the standard represented 26 percent of the total plants analyzed in the GEOMET phase of the study. For the total current study, some 18 percent of the 401 power plants produced concentrations which alone exceeded the 24-hour SO_2 standard. It should be emphasized that if the contribution from all other sources were considered, both the number and percentage of plants exceeding the standard would increase considerably.

The fuel used during 1972 by each power plant modeled in the GEOMET analysis is summarized by state in Tables 3a through 3bb. One table for each

state identifies the plant name; the county and AQCR in which it is located; its 1972 megawatt capacity; the amount of coal, oil, and gas consumed during nominal 1972 operations; the sulfur content of each fuel; and the model used in examining the plant.

The fuel listed for some plants is flagged as an estimate. For these plants, the actual fuel use was adjusted to represent an amount consistent with more normal operations than occurred during 1972. There are several reasons for including such an estimate. If the plant was down for abnormal maintenance, the fuel which would have been consumed during the down period was estimated and added to the 1972 fuel consumption reported to the Federal Power Commission (FPC Form 67). If boilers which operated part of the year were retired from further use, an appropriate adjustment was made to the actual fuel consumption to reflect a normal mode of operation without the retired boilers. Also, if the fuel consumption reflected the operation of one or more new boilers for part of the year, an adjustment was made to include the fuel which would be consumed if the boilers were operated for the full year. In a few cases the estimated fuel was based on 1973 fuel consumption, if this information was available when the plant was analyzed and if 1973 were judged to be more representative of normal plant operations than 1972.

The separate AQCR reports present more specific information on the operations and estimates of the air quality impact of each power plant. In addition to the information presented here in Table 3, the AQCR reports provide: estimates of the highest 24-hour and annual SO_2 concentrations resulting from operations at each plant, the fuel use and SO_2 emission rates associated with these highest concentrations, and the ratio of concentration to emission rate for the plant as a whole (the X/Q ratio). Specific information on stack parameters used in the modeling analysis is also included in an appendix to each report. All the AQCR reports for the current study are in the same format and include this information in the table formats shown in Appendix C of this report.

The maximum ground-level SO_2 concentrations presented for each plant in the AQCR reports show estimates of which plants, considering only the plant's emissions, exceed or approach the National Ambient Air Quality Standards. It should be emphasized that these results include only consideration of power plant emissions. A complete analysis would also have to give consideration to emissions from other sources. However, where two or three power plants in rural areas are close enough to produce interacting effects, estimates were made of the maximum SO_2 concentrations due to the overlapping of the plumes.

New fossil-fueled power plants and expansions of existing plants planned for operation prior to the end of 1977 are described in each AQCR report. A brief discussion is included of the expanded plant output capacity, the type of fuels to be burned (if known), and a qualitative estimate of the impact of the expanded plant on air quality. These discussions serve to identify areas where the reported air quality estimates are likely to be affected by new operations. Additional modeling analysis should be required in these areas before making decisions about the impact of changes in current power plant operations on air quality levels.

The AQCR reports also identify plants which are located in urban environments. The air quality estimates for these plants may be subject to significant additional contributions from the many sources of SO_2 in an urban area, including other power plants and other major sources of SO_2. To evaluate the interaction of concentrations from more than three plants and from the many sources of SO_2 in a densely populated urban area would involve more complex procedures and greater resources than were available for this study. Therefore, an interaction analysis was not performed for these plants. Before any course of action for these plants is chosen, a more detailed and exhaustive analysis of all sources in the vicinity should be performed.

The basis for the maximum concentration day is reported for each plant in each AQCR studied in terms of the principal fuels used, the sulfur content of each, the amount of each fuel consumed, and the amount of SO_2 emitted. These are reported both for the nominal load case and the maximum load case. A comparison of these data will indicate how near the nominal load case is to the maximum load case in terms of types and amounts of fuel consumed. Where more than one fuel is consumed at a plant, the maximum load case is based on the assumption that each boiler is burning the fuel which results in the highest SO_2 emission rate of any fuel burned in significant quantity in that boiler during 1972.

The ratios of concentration to emissions (χ/Q) are reported for each plant in each AQCR report for the maximum concentration day (under nominal and maximum load conditions) and for the maximum annual concentration under nominal load conditions. The ratios for annual concentrations are much lower than for 24-hour concentrations primarily because the SO_2 is dispersed over a wider area as a result of day-to-day variations in wind direction and other meteorological parameters. Variations in these ratios from plant to plant are influenced primarily by differences in surrounding terrain and stack characteristics. Elevated terrain and low stacks both generally result in higher concentrations from a plant and therefore increase the χ/Q ratio. It should be noted that the χ/Q ratios generally cannot be used to estimate the impact of changes in plant operating conditions. This is because the relationship between emissions and ambient air concentrations is dependent on source factors, meteorological factors, and local terrain effects. A change in plant operating conditions and emissions does not necessarily imply a directly proportional change in ambient concentrations. Detailed additional analysis must be undertaken to estimate the impact of different operating conditions, whether th involves a change in the fuel type in part or all of the plant, increased o decreased plant capacity, altered operating levels, new stacks, new stack-to-b ler combinations, or other significant changes.

IV. APPROPRIATE USES OF DISPERSION MODEL RESULTS

Under contract to EPA, Walden Research and GEOMET, Incorporated have completed a series of dispersion model studies of power plants. These include virtually all the Nation's major fossil-fuel power plants which reported to the Federal Power Commission in 1972. Limitations of these studies have been discussed in some detail elsewhere in this report and in the individual AQCR reports. It must be emphasized that results of these studies should not be taken in isolation as providing a definitive "answer" regarding the air quality impact of particular plants. This caution is necessary due to the nature of various assumptions and judgmental factors inherent in a broad study which does not evaluate individual plants in great detail.

However, even with these limitations, the dispersion model studies are of value for use in generalized analyses which assess the overall effect of some plan of action on the power plant industry. The dispersion model studies have already been used in this way for analyses related to national policy proposals affecting a large number of power plants. These analyses have been used effectively in a number of energy-environmental policy deliberations, among them: the Clean Fuels Policy, SO_x scrubber hearings, proposed oil-to-coal conversions, actions required under the Energy Supply and Environmental Coordination Act, tall stack policy, supplementary control system evaluation, the Ohio SO_x hearing, and testimony on options for SO_2 control before congressional committees.

Table 1. Listing of References for Modeling Analyses

AQCR Number[5]	AQCR Name (States)	Report Reference(s) for Each AQCR[6]			
		51 AQCR Report[1]	63 Coal-Conversion Plant Report[2]	128 AQCR Study	
				Volume I[3]	Volume II[4]
003	East Alabama (Alabama)				1
004	Metropolitan Birmingham (Alabama)	3			
005	Mobile-Pensacola-Panama City (Alabama/Florida/Mississippi)	12			
007	Tennessee River Valley (Alabama/Tennessee)	2			
012	Arizona-New Mexico Southern Border (Arizona/New Mexico)				1
013	Clark-Mohave (Arizona/Nevada)				5
014	Four Corners (Arizona/Colorado/New Mexico/Utah)				2
015	Phoenix-Tucson (Arizona)				8
016	Central Arkansas (Arkansas)				2
018	Metropolitan Memphis (Arkansas/Mississippi/Tennessee)				1
019	Monroe-El Dorado (Arkansas/Louisiana)				3
020	Northeast Arkansas (Arkansas)				3
021	Northwest Arkansas (Arkansas)				1
022	Shreveport-Texarkana-Tyler (Arkansas/Louisiana/Oklahoma/Texas)				9
024	Metropolitan Los Angeles (California)			16	
025	North Central Coast (California)			1	
026	Northeast Plateau (California)			1	
029	San Diego (California)			4	
030	San Francisco Bay Area (California)			7	
031	San Joaquin Valley (California)			1	
032	South Central Coast (California)			1	
033	Southeast Desert (California)			2	
035	Grand Mesa (Colorado)				2
036	Metropolitan Denver (Colorado)				4

(Continued)

(1) "Summary Report on Modeling Analysis of Power Plants for Compliance Extensions in 51 Air Quality Control Regions," Walden Research (Contract 68-02-0049), December 17, 1973, EPA Report Number EPA-450/3-75-060.

(2) "Summary Report on Modeling Analysis of Power Plants for Fuel Conversion," Walden Research (Contract 68-02-1377), May 1975, EPA Report Number EPA-450/3-75-064.

(3) "Summary Report on Modeling Analysis of Selected Power Plants in 128 AQCRs for Evaluation of Impact on Ambient SO_2 Concentrations, Volume I," Walden Research (Contract 68-02-1484), June 1975, EPA Report Number 450/3-75-062.

(4) Summarized in this volume.

(5) For AQCRs not listed, no analysis has been performed because no power plants in the AQCR reported to FPC in 1972. In addition, plants outside the contiguous 48 states have not been modeled.

(6) The number of plants in each AQCR examined in the respective effort is noted.

Table 1. Listing of References for Modeling Analyses (Continued)

AQCR Number	AQCR Name (State)	Report Reference(s) for Each AQCR			
		51 AQCR Report	63 Coal-Conversion Plant Report	128 AQCR Study	
				Volume I	Volume II
038	San Isabel (Colorado)				4
040	Yampa (Colorado)				1
041	Eastern Connecticut (Connecticut)		1		
042	Hartford -New Haven -Springfield (Connecticut/ Massachusetts)		8		
043	New Jersey - New York-Connecticut (New Jersey/ New York/Connecticut)		16	14	
045	Metropolitan Philadelphia (Pennsylvania/New Jersey/Delaware)		13		
046	Southern Delaware (Delaware)			2	
047	National Capital (Washington, D.C. /Virginia/ Maryland)		6		
048	Central Florida (Florida)			5	
049	Jacksonville - Brunswick (Florida/Georgia)	9			
050	Southeast Florida (Florida)			7	
051	Southwest Florida (Florida)			2	
052	West Central Florida (Florida)		1	8	
053	Augusta-Aiken (Georgia/South Carolina)	1			
054	Central Georgia (Georgia)	2			
055	Chattanooga (Georgia/Tennessee)	2			
056	Metropolitan Atlanta (Georgia)	3			
058	Savannah -Beaufort (Georgia/South Carolina)	4			
059	Southwest Georgia (Georgia)	1			
065	Burlington - Keokuk (Illinois/Iowa)	5		1	
066	East Central Illinois (Illinois)	2			
067	Metropolitan Chicago (Illinois/Indiana)				11
068	Metropolitan Dubuque (Illinois/Iowa/Wisconsin)				3
069	Metropolitan Quad Cities (Illinois/Iowa)				3
070	Metropolitan St. Louis (Illinois/Missouri)				9
071	North Central Illinois (Illinois)	2			
072	Paducah-Cairo (Illinois/Kentucky)	4			
073	Rockford-Janesville-Beloit (Illinois/Wisconsin)				3
074	Southeast Illinois (Illinois)	2			
075	West Central Illinois (Illinois/Indiana)	6			
077	Evansville (Indiana/Kentucky)	7		2	
078	Louisville (Indiana/Kentucky)	4			
079	Metropolitan Cincinnati (Indiana/Kentucky/ Ohio)	5		1	
080	Metropolitan Indianapolis (Indiana)	4			
082	South Bend-Elkhart-Benton Harbor (Indiana/ Michigan)	2			
083	Southern Indiana (Indiana)	1			
084	Wabash Valley (Indiana)	5			

(Continued)

Table 1. Listing of References for Modeling Analyses (Continued)

AQCR Number	AQCR Name (State)	Report Reference(s) for Each AQCR			
		51 AQCR Report	63 Coal-Conversion Plant Report	128 AQCR Study	
				Volume I	Volume II
085	Metropolitan Omaha-Council Bluffs (Iowa/Nebraska)				4
086	Metropolitan Sioux City (Iowa/Nebraska/South Dakota)				2
087	Metropolitan Sioux Falls (Iowa/South Dakota)				2
088	Northeast Iowa (Iowa)				5
092	South Central Iowa (Iowa)				4
094	Metropolitan Kansas City (Kansas/Missouri)				12
095	Northeast Kansas (Kansas)				2
096	North Central Kansas (Kansas)				1
097	Northwest Kansas (Kansas)				1
098	Southeast Kansas (Kansas)				2
099	South Central Kansas (Kansas)				4
100	Southwest Kansas (Kansas)				2
101	Appalachian (Kentucky)				1
102	Bluegrass-Lexington (Kentucky)	3			
103	Huntington-Ashland-Portsmouth-Ironton (Kentucky/Ohio/West Virginia)	5			
105	South Central Kentucky (Kentucky)				1
106	Southern Louisiana-Southeast Texas (Louisiana/Texas)				19
107	Androscoggin Valley (Maine/New Hampshire)		1		
109	Down East (Maine)			1	
110	Metropolitan Portland (Maine)			1	
113	Cumberland-Keyser (West Virginia/Maryland)	2			
114	Eastern Shore (Maryland)		1		
115	Metropolitan Baltimore (Maryland)			5	
116	Southern Maryland (Maryland)		1		
119	Metropolitan Boston (Massachusetts)		1	5	
120	Metropolitan Providence (Massachusetts/Rhode Island)		5	3	
121	Merrimack Valley-Southern New Hampshire (Massachusetts/New Hampshire)		1	1	
122	Central Michigan (Michigan)	5			
123	Metropolitan Detroit-Port Huron (Michigan)				9
124	Metropolitan Toledo (Michigan/Ohio)	4			
125	South Central Michigan (Michigan)	5		1	
126	Upper Michigan (Michigan)				1
127	Central Minnesota (Minnesota)				1
128	Southeast Minnesota-La Crosse (Minnesota/Wisconsin)	6			
129	Duluth-Superior (Minnesota/Wisconsin)	3			
131	Minneapolis-Saint Paul (Minnesota)	4		1	
132	Northwest Minnesota (Minnesota)				1

(Continued)

Table 1. Listing of References for Modeling Analyses (Continued)

AQCR Number	AQCR Name (State)	Report Reference(s) for Each AQCR			
		51 AQCR Report	63 Coal-Conversion Plant Report	128 AQCR Study	
				Volume I	Volume II
133	Southwest Minnesota (Minnesota)				1
134	Mississippi Delta (Mississippi)				1
136	Northern Piedmont (North Carolina)			1	
137	Northern Missouri (Missouri)				1
138	Southeast Missouri (Missouri)				1
139	Southwest Missouri (Missouri)				3
140	Billings (Montana)				2
143	Miles City (Montana)				1
145	Lincoln-Beatrice-Fairbury (Nebraska)				2
146	Nebraska (Nebraska)				2
148	Northwest Nevada (Nevada)				2
150	New Jersey (New Jersey)		2		
151	Northeast Pennsylvania-Upper Delaware Valley (Pennsylvania/New Jersey)	6		1	
152	Albuquerque-Mid Rio Grande (New Mexico)				3
153	El Paso-Las Cruces-Alamogordo (New Mexico/Texas)				2
155	Pecos-Permian Basin (New Mexico)				3
158	Central New York (New York)			1	
159	Champlain Valley (Vermont/New York)			1	
160	Genesse-Finger Lakes (New York)			3	
161	Hudson Valley (New York)		2		
162	Niagara Frontier (New York)			1	
163	Southern Tier East (New York)			2	
164	Southern Tier West (New York)			3	
165	Eastern Mountain (North Carolina)			2	
166	Eastern Piedmont (North Carolina)			2	
167	Metropolitan Charlotte (North Carolina)	3			
169	Sandhills (North Carolina)			1	
170	South Coastal Plain (North Carolina)		1	1	
171	Western Mountain (North Carolina)			1	
172	North Dakota (North Dakota)				4
173	Dayton (Ohio)	4			
174	Greater Metropolitan Cleveland (Ohio)	7			
175	Mansfield-Marion (Ohio)			1	
176	Metropolitan Columbus (Ohio)	1		1	
177	Northwest Ohio (Ohio)	1			
178	Northwest Pennsylvania-Youngstown (Pennsylvania/Ohio)	6			
179	Parkersburg-Marietta (West Virginia/Ohio)	3			
180	Sandusky (Ohio)			1	
181	Steubenville-Weirton-Wheeling (Ohio/West Virginia)	7			
183	Zanesville-Cambridge (Ohio)	2			

(Continued)

Table 1. Listing of References for Modeling Analyses (Continued)

AQCR Number	AQCR Name (State)	Report Reference(s) for Each AQCR			
		51 AQCR Report	63 Coal-Conversion Plant Report	128 AQCR Study	
				Volume I	Volume II
184	Central Oklahoma (Oklahoma)				3
185	North Central Oklahoma (Oklahoma)				1
186	Northeastern Oklahoma (Oklahoma)				4
187	Northwestern Oklahoma (Oklahoma)				1
188	Southeastern Oklahoma (Oklahoma)				3
189	Southwestern Oklahoma (Oklahoma)				2
193	Portland (Oregon/Washington)				3
195	Central Pennsylvania (Pennsylvania)	4			
196	South Central Pennsylvania (Pennsylvania)	3			
197	Southwest Pennsylvania (Pennsylvania)	12			
199	Charleston (South Carolina)	3			
200	Columbia (South Carolina)			2	
201	Florence (South Carolina)			1	
202	Greenville-Spartanburg (South Carolina)			1	
203	Greenwood (South Carolina)			1	
204	Georgetown (South Carolina)			1	
207	East Tennessee-Southwestern Virginia (Tennessee/Virginia)	5			
208	Middle Tennessee (Tennessee)	3			
210	Abilene-Wichita Falls (Texas)			5	
211	Amarillo-Lubbock (Texas)			9	
212	Austin-Waco (Texas)			7	
213	Brownsville-Laredo (Texas)			4	
214	Corpus Christi-Victoria (Texas)			3	
215	Metropolitan Dallas-Fort Worth (Texas)			15	
216	Metropolitan Houston-Galveston (Texas)			10	
217	Metropolitan San Antonio (Texas)			6	
218	Midland-Odessa-San Angelo (Texas)			5	
219	Utah (Utah)				1
220	Wasatch Front (Utah)				3
222	Central Virginia (Virginia)			1	
223	Hampton Roads (Virginia)	2	1		
224	Northeastern Virginia (Virginia)			1	
225	State Capital (Virginia)		2		
226	Valley of Virginia (Virginia)			2	
229	Puget Sound (Washington)				1
234	Kanawha Valley (West Virginia)			3	
235	North Central West Virginia (West Virginia)	4			
237	Lake Michigan (Wisconsin)				2
238	North Central Wisconsin (Wisconsin)				1
239	Southeast Wisconsin-La Crosse (Wisconsin)	5		2	

(Continued)

Table 1. List of References for Modeling Analyses (Concluded)

AQCR Number	AQCR Name (State)	Report Reference(s) for Each AQCR			
		51 AQCR Report	63 Coal-Conversion Plant Report	128 AQCR Study	
				Volume I	Volume II
240	Southern Wisconsin (Wisconsin)				1
241	Casper (Wyoming)				1
243	Wyoming (Wyoming)				1
	Total Number of Plants Analyzed	206	63	195	206
	GRAND TOTAL = 670 Power Plants				

Table 2. Power Plant Summary for 128 AQCRs

Contractor	Total Plants	Plants Which, by Themselves, Exceed the 24-Hour SO_2 Standard* 1972 Operations, Nominal or Maximum Load
Walden (Volume I)	195	20
GEOMET (Volume II)	206	54
TOTAL	401	74

* This is not representative of all the power plants in the U.S. since many large coal- and oil-fired plants were modeled previously and are not included here.

Table 3a. Summary of 1972 Power Plant Fuel Use for Plants in Alabama*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
003	Gadsden (V)**/Alabama Power Company	Etowa	138	364	1.1	168	0.5†	509

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3b. Summary of 1972 Power Plant Fuel Use for Plants in Arizona*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
012	Apache (E)**/Arizona Electric Power Cooperation	Cochise	105				0.4	5530
013	Yucca (E)/Arizona Public Service Company	Yuma	87				0.9	2880
014	Cholla (V)/Arizona Public Service Company	Navajo	114	418†	0.4			26
015	Agua Fria II (E)/Salt River Project, Agricultural Improvement Power District	Maricopa	390			15966	0.4	18860
015	Crosscut (V)/Salt River Project, Agricultural Improvement Power District	Maricopa	30			49	0.4	139
015	Demoss Petrie (E)/Tucson Gas & Electric Company	Pima	105			1529	0.7	3166
015	Irvington (E)/Tucson Gas & Electric Company	Pima	505			19299	0.6	19572
015	Kyrene (V)/Salt River Project	Maricopa	108			2331	0.3	3165
015	Ocotillo (E)/Arizona Public Service Company	Maricopa	227			4582	0.6	11726
015	Phoenix (E)/Arizona Public Service Company	Maricopa	116			714	0.7	1279
015	Saguaro (E)/Arizona Public Service Company	Pima	250			4712	0.7	7712

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3c. Summary of 1972 Power Plant Fuel Use for Plants in Arkansas*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
016	Lynch/Arkansas Power and Light Company	Pulaski	260			3906	0.8	6880
016	Lake Catherine (V)**/ Arkansas Power and Light Company	Hot Springs	756			46714	0.8	21059
019	McClellan (E)/Arkansas Electric Coop Corporation	Ouachita	134			3880	0.4	3355†
020	Bailey/Arkansas Electric Coop Corporation	Woodruff	120			15204	1.8	3674
020	Moses (E)/Arkansas Power and Light Company	St. Francis	138			25037	0.8	
020	Ritchie (E)/Arkansas Power and Light Company	Phillips	904			85676	0.8	26302
021	Fitzhugh (V)/Arkansas Electric Coop Corporation	Franklin	60			6380	1.1	1495
022	Couch (E)/Arkansas Power and Light Company	Lafayette	187			5586	0.8†	5523

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3d. Summary of 1972 Power Plant Fuel Use for Plants in Colorado*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
035	Cameo/Public Service Company of Colorado	Mesa	75	126	0.5			78
035	Nucla (V)**/Colorado-UTE Electric Association, Inc.	Montrose	35	79	0.8			
036	Arapahoe (E)/Public Service Company of Colorado	Denver	250	372	0.4			9164
036	Cherokee (E)/Public Service Company of Colorado	Adams	801	1644	0.5			20900
036	Valmont (E)/Public Service Company of Colorado	Boulder	282	422	0.6			7765
036	Zuni (E)/Public Service Company of Colorado	Denver	115			17553	1.2	7607
038	Pueblo (E)/Central Telephone and Utility Corp.	Pueblo	32			509	0.3	3011†
038	Clark (E)/Central Telephone and Utility Corp.	Fremont	44	82	0.7			2501
038	Birdsall (E)/Colorado Springs Power and Light Department	El Paso	62			357	0.6	2953
038	Drake (E)/Colorado Springs Power and Light Department	El Paso	150	119	1.1			6870
040	Hayden (V)/Colorado-UTE Electric Association, Inc.	Routt	163	575	0.4	40	0.2	

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3e. Summary of 1972 Power Plant Fuel Use for Plants in Illinois*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
067	Crawford/Commonwealth Edison Power Company	Cook	702	935	0.6			19538
067	Fisk/Commonwealth Edison Power Company	Cook	547	743	0.6			7534
067	Ridgeland/Commonwealth Edison Power Company	Cook	690			234398	0.8	20
067	Winnetka/Village of Winnetka	Cook	26	20	0.8			378
067	Waukegan/Commonwealth Edison Power Company	Lake	933	2127	1.8	1264	0.5	938
067	Joilet/Commonwealth Edison Power Company	Will	1787	3534	3.0			4297
067	Will County/Commonwealth Edison Power Company	Will	1269	2528	1.3	6334	0.5	
067	Calumet/Commonwealth Edison Power Company	Cook	107					5386
069	Moline (E)**/Iowa-Illinois Gas and Electric Company	Rock Island	99	5.7	1.8	6820	0.4	3290
070	Baldwin (E)/Illinois Power Company	Randolph	623	2185	4.1	94	0.3†	
070	Cahokia (E)/Union Electric Company	St. Clair	300	222	3.3	37258	2.3	
070	Wood River (E)/Illinois Power Company	Madison	650	1359	3.0	558	0.3	2529
070	Venice-I (E)/Illinois Power Company	Madison	55			987	0.3	19
070	Venice-II (E)/Illinois Power Company	Madison	474	872	2.8	41538	0.3	1352†
073	Sabrooke (E)/Commonwealth Edison Company	Winnebago	146	311	1.1			842

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addidtion, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3f. Summary of 1972 Power Plant Fuel Use for Plants in Indiana*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
067	Mitchell**/Northern Indiana Public Service Company	Lake	529	1437	3.2			797
067	State Line/Commonwealth Edison Power Company	Lake	972	2203	1.6			5278
067	Bailly/Northern Indiana Public Service Company	Porter	616	1186	3.8			670

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

Table 3g. Summary of 1972 Power Plant Fuel Use for Plants in Iowa*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
068	Dubuque (V)**/Interstate Power Company	Clinton	91	121	3.2			2118
069	M. L. Kapp (E)/Interstate Power Company	Clinton	237	575	3.1			372
069	Riverside (E)/Iowa-Illinois Gas and Electric Company	Scott	222	501	2.6			6210
085	Council Bluffs/Iowa Power and Light Company	Pattawattamie	131	282	1.0			2814
086	Big Sioux (E)/Iowa Public Service Company	Woodbury	40			647	0.5	616
086	George Neal/Iowa Public Service Company	Woodbury	496	922†	0.6			5740
088	Lansing (V)/Interstate Power Company	Allamakee	64	154	3.0			
088	6th Street Station (E)/Iowa Electric Light and Power Company	Linn	92	260	2.3	265	1.5	728
088	Prairie Creek (1, 2, 3) (E)/ Central Iowa Power Coop	Linn	96	176	2.5	67	0.3	1709
088	Prairie Creek (4) (E)/Iowa Electric Light and Power Company	Linn	149	321	2.5	190	0.3	530
088	Maynard (E)/Iowa Public Service Company	Blackhawk	100	83	2.4	432	0.0	2740
092	Des Moines (2) (E)/Iowa Power and Light Company	Polk	325	524	4.1	2986	0.4	10737
092	Sutherland (E)/Iowa Electric Light and Power Company	Marshall	157	199	2.8			7523
092	Bridgeport (E)/Iowa Southern Utility Company	Monroe	71	200	3.7			
092	Boone (E)/Iowa Electric Light and Power Company	Boone	34	19	4.3			1543

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3h. Summary of 1972 Power Plant Fuel Use for Plants in Kansas*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
094	Quindaro (2) (V)**/Kansas City Board of Public Utilities	Wyandotte	94	21	4.1			2861
094	Quindaro (3) (V)/Kansas City Board of Public Utilities	Wyandotte	239	109	4.1			1671
094	Kaw (E)/Kansas City Board of Public Utilities	Wyandotte	161	64	3.9			6207
095	Lawrence (E)/The Kansas City Power and Light Company	Douglas	346	72	3.9	99	1.5	16555
095	Lawrence (E)/The Kansas City Power and Light Company	Douglas	613	113	3.9	206	1.5	23316
096	Abilene (E)/The Kansas City Power and Light Company	Dickinson	34			1092	1.5	1294
097	Mullergren (E)/Central Telephone and Utility Corp.	Barton	119					6559†
098	Neosho (E)/Kansas Gas and Electric Company	Labette	114	2	3.8†	1003	2.2	4186
098	Riverton (E)/Empire Dist. Electric Company	Cherokee	155	37	3.8	962	1.5	8812
099	Evans/Kansas Gas and Electric Company	Sedgwick	540					28192
099	Gill/Kansas Gas and Electric Company	Sedgwick	348					18065
099	Hutchinson (E)/Kansas Power and Light Company	Reno	257			3234	1.5	15520
099	Ripley (E)/Kansas Gas and Electric Company	Sedgwick	87			589	1.7	7198
100	Cimarron River (E)/Central Telephone and Utilities Corporation	Seward	65					3663
100	Large (E)/Central Telephone and Utilities Corp.	Ford	180			1567	0.4	7073

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 31. Summary of 1972 Power Plant Fuel Use for Plants in Kentucky*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
101	Pineville (V)**/Kentucky Utility Company	Bell	38	68	1.6			
105	Cooper (V)/East Kentucky Rural Electric Coop.	Pulaski	354	824	2.2	0.1†	0.1†	

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† For ignition only.

Table 3j. Summary of 1972 Power Plant Fuel Use for Plants in Louisiana*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
019	Monroe (E)**/City of Monroe Power Company	Ouachita	166					5668
019	Sterlington/Louisiana Power and Light Company	Ouachita	352					20088
022	Lieberman (E)/Southwestern Electric Power Company	Caddo	277			420	0.8†	9916
022	Arsenal Hill (E)/Southwestern Electric Power Company	Caddo	170					4042
106	Big Cajun (1)/Cajun Electric Power Coop	Point Coupee	230					9334
106	Coughlin (E)/Central Louisiana Electric Company	Evangeline	483			6030	0.2	17641
106	Teche/Central Louisiana Electric Company	St. Mary	428					17237
106	Bonin/City of Lafayette Utility System	Lafayette	143			1089	0.7†	4602
106	Rodemacher/City of Lafayette Utility System	Lafayette	43			544	0.7†	931
106	Minicipal/City of Morgan City	St. Mary	33					1754
106	Nelson/Gulf States Utility Company	Calcasieu	982			10299	0.2	30504
106	Willow Glen/Gulf States Utility Company	Iberville	994			3523	0.3	48391
106	Louisiana (1)/Gulf States Utility Company	E. Baton Rouge	253					40257
106	Louisiana (2)/Gulf States Utility Company	E. Baton Rouge	175					14216

(Continued)

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3j. Summary of 1972 Power Plant Fuel Use for Plants in Louisiana* (Concluded)

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
106	Little Gypsy/Louisiana Power & Light Company	St. Charles	1251			3161	0.3†	63497
106	Nine Mile/Louisiana Power & Light Company	Jefferson	1134					66736
106	Paterson/New Orleans Public Service, Inc.	Orleans	218			9352		12560
106	Michoud/New Orleans Public Service, Inc.	Orleans	959			4584	1.2	38446
106	Market Street/New Orleans Public Service, Inc.	Orleans	96					3368
106	Houma/City of Houma	Terrebonne	38					1246
106	Alexandria(2)/Alexandria Electric Light & Waterworks	Rapides	98			906	0.1	3868

† Estimated.

Table 3k. Summary of 1972 Power Plant Fuel Use for Plants in Michigan*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
123	Delray**/The Detroit Edison Company	Wayne	375			141775	1.9	11619
123	Conners Creek/The Detroit Edison Company	Wayne	540	816	2.2	24104	0.3	11359†
123	Mistersky/City of Detroit Public Lighting Commission	Wayne	174	347	1.5			
123	Trenton Channel/The Detroit Edison Company	Wayne	1076	2118	2.3	11913	0.3	16300
123	Marysville/The Detroit Edison Company	St. Clair	230	531	2.5			103†
123	Pennsalt/The Detroit Edison Company	Wayne	37	151	1.2	2397†	0.3	
123	River Rouge/The Detroit Edison Company	Wayne	933	1764	3.2	41081	2.1	9902
123	St. Clair/The Detroit Edison Company	St. Clair	1905	4508	3.0	34143	2.1	167
123	Wyandotte N./The Detroit Edison Company	Wayne	54	284	0.8	6407	0.3	1731
126	Presque Isle (E)/Upper Peninsula Generating Company	Marquette	175	511	1.0			

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 31. Summary of 1972 Power Plant Fuel Use for Plants in Minnesota*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
127	Elk River (E)**/United Power Association	Sherburne	46	19	2.7	5540	0.5	393
132	Hoot Lake (E)/Otter Tail Power Company	Otter Tail	137	696	0.9			
133	Minnesota Valley (E)/Northern States Power Company	Chippewa	46	82†	1.8			515

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3m. Summary of 1972 Power Plant Fuel Use for Plants in Mississippi*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
134	Delta**/Mississippi Power and Light Company	Bolivar	221			23630	2.7	7523

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) Indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

Table 3n. Summary of 1972 Power Plant Fuel Use for Plants in Missouri*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
070	Ashley (E)**/Union Electric Company	City of St. Louis	70			34373	2.2†	
070	Labadie (E)/Union Electric Company	Franklin	2286	5310	3.1	7405	0.3††	
070	Meramec (E)/Union Electric Company	St. Louis	923	2182	2.0			149
070	Sioux (E)/Union Electric Company	St. Charles	1100	1704	3.3	512	0.3	
094	Sibley (E)/Missouri Public Service Company	Jackson	518	891	3.7			
094	Green (E)/Missouri Public Service Company	Cass	50	5	3.7			1773
094	Grand Avenue (E)/Kansas City Power and Light Company	Jackson	127	135	3.5	273	0.6	1450
094	Hawthorne (E)/Kansas City Power and Light Company	Jackson	908	1144	1.7			15479
094	Northeast (E)/Kansas City Power and Light Company	Jackson	233			2806	0.6	2198
094	Missouri City (E)/N. W. Electric Power Coop	Clay	40	31	3.8	6342	1.8	
094	Blue Valley (E)/City Power and Light Company Independence, Mo.	Jackson	115	27	3.4	71	0.5	4888
094	Edmond (E)/St. Joseph Light and Power Company	Buchanan	42			1418	2.3	1881

(Continued)

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

†† 1973 data.

Table 3n. Summary of 1972 Power Plant Fuel Use for Plants in Missouri* (Concluded)

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
094	Lakeroad(E)/St. Joseph Light & Power Company	Buchanan	150	76	3.6	903	2.2	11786
137	Hill/Associated Electric Coop, Inc.	Randolph	470	1539	4.2			
138	City of New Madrid (E)/ Associated Electric Coop, Inc.	New Madrid	650	317	4.0			
139	Asbury (E)/Empire Dist. Electric Co.	Jasper	213	654	4.8			
139	James River (E)/City Utility of Springfield	Greene	257	74	4.1			9498
139	Montrose (E)/Kansas City Power & Light Company	Henry	563	1849	5.3	286	0.6	

Table 3o. Summary of 1972 Power Plant Fuel Use for Plants in Montana*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
140	Bird (V)**/The Montana Power Co.	Yellowstone	69			588	1.8	84
140	Corette (V)/The Montana Power Co.	Yellowstone	173	449	0.6			519
143	Lewis & Clark (E)/Montana-Dakota Util. Co.	Richland	50	320	0.6			141

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

Table 3p. Summary of 1972 Power Plant Fuel Use for Plants in Nebraska*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
085	Kramer (E)**/Nebraska Public Power District	Sarpy	114	146	3.0			1841
085	Jones St. (E)/Omaha Public Power District	Douglas	165	16	2.8	4512	0.1	922†
085	North Omaha (E)/Omaha Public Power District	Douglas	645	743	2.1			16574
145	Lincoln (E)/Nebraska Public Power District	Lancaster	32	15	4.3	0.4	2.0	594
145	Sheldon (E)/Nebraska Public Power District	Lancaster	229	252	3.9			6990
146	Bluffs (V)/Nebraska Public Power District	Scotts-bluff	42					2928
146	C.W. Burdick Station (E)/ City of Grand Island Water & Light Dept.	Hall	93			1121	0.9	2457

* Other plants in each AQCR may have been modeled previously, please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3q. Summary of 1972 Power Plant Fuel Use for Plants in Nevada*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
013	Mohave (V)**/S. California Edison	Clark	1520	2906	0.4			8460
013	Reid Gardner (E)/Nevada Power Co.	Clark	227	645	0.5	323	0.2	
013	Clark (E)/Nevada Power Co.	Clark	190			1958	0.4	9810
013	Sunrise (E)/Nevada Power Co.	Clark	82			583	0.4	5170
148	Fort Churchill (V)/Sierra Pacific Power Co.	Lyon	220			1886	0.8	12428
148	Tracy (V)/Sierra Pacific Power Co.	Storey	133			500	0.8	2621

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

Table 3r. Summary of 1972 Power Plant Fuel Use for Plants in New Mexico*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
014	Four Corners (V)**/Arizona Public Service Co.	San Juan	2270	6893	0.7			1871
152	Person (V)/Public Service Co. of N. Mexico	Bernalilla	125			3776	0.5	4427
152	Prager (V)/Public Service Co. of N. Mexico	Bernalilla	35					25
152	Reeves (V)/Public Service Co. of N. Mexico	Bernalilla	175			7035	1.0	11176
153	Rio Grande (V)/El Paso Electric Co.	Dona Ana	402			5015	1.0	9981
155	Carlsbad (E)/Southwestern Public Service	Eddy	44			819	0.7	1880
155	Cunningham (E)/Southwestern Public Service	Lea	265					14572
155	Roswell (E)/Southwestern Public Service	Chaves	24			496	0.5	1151

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

Table 3s. Summary of 1972 Power Plant Fuel Use for Plants in North Dakota*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
172	Heskett (E)**/Montana-Dakota Utility Company	Morton	100	569	0.7			
172	Young (E)/Minnkota Power Coop, Inc.	Oliver	256	1612	0.7	739	0.3	
172	Leland Olds (E)/Basin Electric Power Coop, Inc.	Mercer	216	1407	0.7	101††	0.5†	
172	Stanton (E)/United Power Association	Mercer	172	862	0.8	378††	0.5	

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

†† Ignition only.

Table 3t. Summary of 1972 Power Plant Fuel Use for Plants in Oklahoma*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
184	Bell Isle (E)**/Oklahoma Gas and Electric Company	Oklahoma	55					994
184	Horseshoe Lake (E)/Oklahoma Gas and Electric Company	Oklahoma	916			2190	0.7	45766
184	Mustang (E)/Oklahoma Gas and Electric Company	Canadian	509					31161
185	Osage (E)/Oklahoma Gas and Electric Company	Kay	40					1444
186	Tulsa (E)/Public Service Company of Oklahoma	Tulsa	482					33081
186	Riverbank (E)/Oklahoma Gas and Electric Company	Muskogee	196					11830
186	Northeastern (E)/Public Service Company of Oklahoma	Rogers	642					39159
186	Chouteau (E)/Grand River River Dam Authority	Mayes	56					7202
187	Mooreland (E)/Western Farmers Electric Coop	Woodward	191					10252
188	Seminole/Oklahoma Gas and Electric Company	Seminole	567					26158
188	Weleetka (V)/Public Service Company of Oklahoma	Okfuskee	83					1952
188	Arbuckle (E)/Oklahoma Gas and Electric Company	Murray	74					3187
189	Anadarko (E)/Western Farmers Power Coop	Cadoo	85			567	0.7†	4441
189	Southwestern (E)/Public Service Company of Oklahoma	Cadoo	483					28470

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3u. Summary of 1972 Power Plant Fuel Use for Plants in Oregon*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
193	Lincoln (V)**/Pacific Power and Light Company	Multnomah	36			4402	0.2	1259

* Other plants in each AQCR amy have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

Table 3v. Summary of 1972 Power Plant Fuel Use for Plants in South Dakota*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
087	Pathfinder (E)**/Northern States Power Co.	Minnehaha	75			10460	0.2	1020
087	Lawrence (E)/Northern States Power Co.	Minnehaha	48	53	2.1	10	0.2†	1214

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3w. Summary of 1972 Power Plant Fuel Use for Plants in Tennessee*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
018	Allen (E)**/TVA Tennessee Valley Authority	Shelby	990	1375	3.3	70	0.3	15331

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

Table 3x. Summary of 1972 Power Plant Fuel Use for Plants in Texas*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
022	Wilkes (E)**/Southwestern Electric Power Company	Marion	882					56319
022	Knox Lee (E)/Southwestern Electric Power Company	Gregg	186					14072
022	Lone Star (E)/Southwestern Electric Power Company	Morris	50					3495
022	River Crest/Texas Power and Light Company	Red River	112			2166	0.7	1117
022	Stryker (E)/Texas Power and Light Company	Cherokee	703					28439
022	Trinidad (E)/Texas Power and Light Company	Henderson	412			2492	0.7	12745
106	Neches/Gulf States Utility Company	Jefferson	452					25256
106	Sabine/Gulf States Utility Company	Orange	952					49621
153	Newman (V)/El Paso Electric Company	El Paso	266					14935 †

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3y. Summary of 1972 Power Plant Fuel Use for Plants in Utah*

AQCR #	Plant Name/Company	County	†Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
219	Carbon (V)**/Utah Power & Light Co.	Carbon	166	387	0.5	144	0.6†	
220	Gadsby (V)/Utah Power & Light Co.	Salt Lake	252	142	0.5	52416	0.9	2804
220	Hale (V)/Utah Power & Light Co.	Utah	59	18	0.5			597
220	Jordan (V)/Utah Power & Light Co.	Salt Lake	25			52	1.1	2

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for inter-state AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3z. Summary of 1972 Power Plant Fuel Use for Plants in Washington*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
229	Shuffleton(V)**/Puget Sound Power & Light Co.	King	86			2268	1.3	
193	Longview (V)/Cowlitz County Pub. Util. Dist. #1	Cowlitz	27	28†		191	0.5	
193	Centralia (E)/Pacific Power & Light Co.	Lewis	1330	3741	0.5	3734	0.3	

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Wood waste - units are 10^3 x 200 ft^3; SO_2 emissions are calculated for an emission factor of 1.5 lb. SO_2 per ton of fuel; actual fuel weight is 2.75 tons per fuel unit.

Table 3aa. Summary of 1972 Power Plant Fuel Use for Plants in Wisconsin*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
068	Stoneman (V)**/Dairyland Power Coop.	Grant	52	117	3.7	95	0.3†	
068	Nelson Dewey (E)/Wisconsin Power & Light Co.	Grant	227	638	3.5			
073	Rock River (E)/Wisconsin Power & Light Co.	Rock	150	389	2.9			
073	Blackhawk (E)/Wisconsin Power & Light Co.	Rock	50	8	3.0			2868
237	J.P. Pulliam/Wisconsin Public Service Corp.	Brown	392	1071	2.5	710	0.3	328
237	Edgewater (E)/Wisconsin Power & Light Co.	Sheboygan	477	1297	2.5	21	0.3	
238	Weston (V)/Wisconsin Public Service Co.	Marathon	135	282	3.2			2188
240	Blount (E)/Madison Gas & Electric Co.	Dane	196	253	2.6	168	0.3	4426

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Estimated.

Table 3bb. Summary of 1972 Power Plant Fuel Use for Plants in Wyoming*

AQCR #	Plant Name/Company	County	Plant Capacity MW	1972 Annual Fuel Use				
				Coal		Oil		Natural Gas
				10^3 tons	% S	10^3 gal	% S	10^6 ft^3
241	Johnston (V)**/Pacific Power & Light Co.	Converse	758	2822	0.6	520††	0.3	
243	Naughton (V)/Utah Power & Light Co.	Lincoln	707	2308†	0.6			42

* Other plants in each AQCR may have been modeled previously; please refer to Table 1. In addition, for interstate AQCRs, other plants located in the same AQCR but in another state are listed with the other state.

** (V) indicates that plant was modeled using VALLEY model, (E) indicates that plant was modeled using CRSTER model, no letter indicates plant was modeled with CRSMOD model.

† Ignition only.

†† Estimated.

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7. "Summary Report on Modeling Analysis of Selected Power Plants in 128 AQCRs for Evaluation of Impact on Ambient SO_2 Concentrations, Volume I," Walden Research (Contract No. 68-02-1484), June 1975, EPA Report Number EPA-450/3-75-062; available from National Technical Information Services, 5285 Port Royal Street, Springfield, Virginia, 22161.

8. "Modeling of the Impact of Power Plants on Ambient SO_2 Concentrations in (Name) AQCR (No.)," GEOMET, Incorporated (Contract No. 68-02-1483). Sixty-eight separate reports, dated between Fall 1974 and Spring 1975, are available from the Air Pollution Technical Information Center, Environmental Protection Agency, Research Triangle Park, North Carolina, 27711. The APTIC number associated with each AQCR report is shown below:

AQCR #	AQCR Name	APTIC #
3	East Alabama	75513
12	Arizona-New Mexico Southern Border	75514
13	Clark-Mohave	75515
14	Four Corners	75516
15	Phoenix-Tucson	75517

(Continued)

AQCR #	AQCR Name	APTIC #
16	Central Arkansas	75518
18	Metropolitan Memphis	75519
19	Monroe-El Dorado	75520
20	NE Arkansas	75521
21	NW Arkansas	75522
22	Shreveport-Texarkana-Tyler	75523
35	Grand Mesa	75524
36	Metropolitan Denver	75525
38	San Isabel	75526
40	Yampa	75527
67	Metropolitan Chicago	75528
68	Metropolitan Dubuque	75529
69	Metropolitan Quad Cities	75530
70	Metropolitan St. Louis	75531
73	Rockford-Janesville-Beloit	75532
85	Metropolitan Omaha-Council Bluffs	75533
86	Metropolitan Sioux City	75534
87	Metropolitan Sioux Falls	75535
88	NE Iowa	75536
92	S. Central Iowa	75537
94	Metropolitan Kansas City	75538
95	NE Kansas	75539
96	N. Central Kansas	75540
97	NW Kansas	75541
98	SE Kansas	75542
99	South Central Kansas	75543
100	SW Kansas	75544
101	Appalachian	75545
105	S. Central Kentucky	75546
106	South Louisiana-SE Texas	75547
123	Metropolitan Detroit-Port Huron	75548
126	Upper Michigan	75549
127	Central Minnesota	75550
132	NW Minnesota	75551
133	SW Minnesota	75552
134	Mississippi Delta	75553
137	North Missouri	75554
138	SE Missouri	75555
139	SW Missouri	75556
140	Billings	75557
143	Miles City	75558
145	Lincoln-Beatrice-Fairbury	75559
146	Nebraska	75560
148	NW Nevada	75561
152	Albuquerque-Mid Rio Grande	75562
153	El Paso-Los Cruces-Alamogardo	75563
155	Pecos-Permian Basin	75564

AQCR #	AQCR Name	APTIC #
172	North Dakota	75565
184	Central Oklahoma	75566
185	North Central Oklahoma	75567
186	NE Oklahoma	75568
187	NW Oklahoma	75569
188	SE Oklahoma	75570
189	SW Oklahoma	75571
193	Portland	75572
219	Utah	75573
220	Wasatch Front	75574
229	Puget Sound	75575
237	Lake Michigan	75576
238	N. Central Wisconsin	75577
240	South Wisconsin	75578
241	Casper	75579
243	Wyoming	75580

Appendix A

A BRIEF DESCRIPTION OF PREVIOUS POWER PLANT MODELING STUDIES

The work summarized in Volumes I and II of this report is a continuation of power plant modeling efforts underway since late in 1972. For convenience, this appendix briefly describes earlier efforts performed either by the Source Receptor Analysis Branch, MDAD, OAQPS, EPA, or by Walden Research, Inc. With completion of the effort reported herein, all fossil fuel-fired power plants reporting to FPC in 1972 have now been modeled. A listing of AQCRs modeled in each effort is given in Table 1 of this report.

The various modeling studies have been performed for slightly different purposes and on somewhat different data bases. Therefore, the following paragraphs give a brief summary of the basis for the previous studies. The most important point to be borne in mind is that these studies should not be taken in isolation as providing a definitive "answer" for a specific plant. All available data on the plant's operation and surroundings should be evaluated in reaching any final conclusions. This supplementary data should include: the impact of other sources in the area, measured air quality data, known or suspected downdraft or fumigation problems, unique nearby terrain features, nearby land use patterns and population distributions, more specific operational data for the plant, impact of units new since the base year of the study, specific meteorological studies for the area, and additional studies and findings by other investigations. Only a full consideration of all these data will lead to a balanced and reasonable decision.

Plants Modeled by SRAB

SRAB has modeled power plants in a total of eight AQCRs. The first three (Indianapolis, Southern Indiana, and Wabash Valley)* were modeled to define an acceptable strategy for dealing with the projected deficit of low sulfur coal arising from full application of SIPs as originally promulgated. That study, which considered all sources of SO_2, concluded that: (1) power plant variances (or plan revisions) offered the best strategy for reducing the low sulfur coal deficit while maintaining at least primary SO_2 air quality standards, and (2) in considering power plants for variances (or plan revisions) it is absolutely essential to consider the 24-hour standard since in most cases this

* "Fuel Distribution Study for the Indianapolis, Southern Indiana, and Wabash Valley AQCRs," EPA draft report, March 1973. Also see Addendum to the draft report, dated April 12, 1973. APTIC Report # 73-03, available from Air Pollution Technical Information Center, Environmental Protection Agency, Research Triangle Park, North Carolina 27711

is the limiting value. Subsequently, SRAB modeled power plants in an additional five midwest AQCRs* to define the amount of low sulfur coal demand reduction which might be obtained by variances to coal-fired power plants. Both of the SRAB studies used FPC data for the power plants and included best available projections to 1975.

Plants Modeled by Walden (BOA 68-02-0049, Tasks 8 and 11)

These modeling studies covered 180 power plants in 43 coal-intensive AQCRs. The purpose of the studies was to determine the amount of low-sulfur coal demand reduction which might be obtained from variances (or plan revisions) for coal-fired power plants. Basic information on power plant operations were taken from FPC Form 67 for 1971; projections to 1975 were made based upon best available information from FPC and other sources. Variance status was determined by a comparison of predicted air quality with a criteria value of 290 $\mu g/m^3$. SO_2 concentrations at or below this value were considered acceptable to achieve primary standards (allowing up to 75 $\mu g/m^3$ for the concurrent contribution of all other sources). Air quality impact at SIP conditions was also calculated. Results of the study were presented in individual AQCR summary reports.

Walden issued a report** which summarized the results of their modeling studies under Tasks 8 and 11 as well as the previous modeling conducted by SRAB. This report summarizes results from modeling 206 power plants in 51 AQCRs. The report showed that low sulfur (less than 1%) coal demand could be reduced by about 137 million tons/year by selective application of variances, while still achieving primary SO_2 air quality standards.

Plants Modeled by Walden (BOA 68-02-1377, Task 2)

As a result of the oil shortage during the winter of 1973-1974 and subsequent legislation, a number of plants have been and are being considered for converting certain units from oil to coal firing. The purpose of this modeling study was to define the air quality impact of possible fuel switches. Both SO_2 and particulate concentrations were evaluated. Modeling was conducted for two situations: (1) 1972 operations, and (2) with certain units switched to

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* "Fuel Distribution Study for Five Midwest AQCRs," EPA draft report, revised May 1973. APTIC Report # 75404; available from Air Pollution Technical Information Center, Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

** "Summary Report on Modeling Analysis of Power Plants for Compliance Extensions in 51 Air Quality Control Regions," Walden Research (Contract No. 68-02-0049), December 17, 1973, EPA Report Number EPA-450/3-75-060; available from National Technical Information Services, 5285 Port Royal Street, Springfield, Virginia 22161.

coal. A comparison of the two situations shows the change in maximum concentrations associated with switching fuels. Time and data constraints made it impossible to project operations beyond 1972. Isopleth maps of concentration superimposed on population density maps were also prepared. Results of the study are presented in four "Group" reports (Group I-IV) and a report on AQCR #42. It is important to note that only those plants proposed for fuel conversion and other plants which might have significant interaction were modeled, not all plants in the AQCR as in the previous studies. Sixty-three plants located in 17 AQCRs were modeled in this study. Walden published a report* summarizing this study in May 1975.

* "Summary Report on Modeling Analysis of Power Plants for Fuel Conversion," Walden Research (Contract 68-02-1377), May 1975, EPA Report Number EPA-450/3-75-064; available from National Technical Information Services, 5285 Port Royal Street, Springfield, Virginia 22161.

Appendix B

DESCRIPTION OF THE MODELS

I. DESCRIPTION OF THE SINGLE SOURCE MODEL (CRSMOD)

The model used to estimate ambient concentrations for plants located where terrain was judged not to have a significant effect is one developed by the Meteorology Laboratory, EPA. This model is designed to estimate concentrations due to sources at a single location for averaging times of 1 hour, 24 hours, and 1 year, with emphasis on the 24-hour value.

This model is a Gaussian plume model using diffusion coefficients based on Turner (1970).* Concentrations are estimated for each hour of the year, based on the wind direction (in increments of 10 degrees), wind speed, mixing height, and Pasquill stability class. For the 1- and 24-hour values, it is assumed that the pollutant does not "decay" significantly between the source and the receptors because of the short travel time involved. Also, decay depends on a number of meteorological variables and might well be insignificant when the meteorological conditions occur which lead to highest SO_2 concentrations.

Meteorological data for 1964 were used. The reasons for this choice are: (1) data from earlier years did not have sufficient resolution in the wind direction; and (2) data from subsequent years are readily available on magnetic tape only for every third hour.

Mixing height data were obtained from the twice-a-day upper air observations made at the most representative upper air station. Hourly mixing heights were estimated by the model using an objective interpolation scheme.

II. DESCRIPTION OF THE SINGLE SOURCE TERRAIN ADJUSTMENT MODEL (CRSTER)

To simulate the effect of elevated terrain in the vicinity of plants where terrain was judged to have a significant effect, the modeling analysis used a terrain adjustment procedure which considered the difference between the plant elevation and the elevation at each receptor. Ground elevations on 10 degree radials as well as points of maximum elevation were determined from U.S.G.S. quadrangle maps. The diffusion model then used the difference between the plant elevation and the receptor elevation to modify the effective stack height and thereby adjust the predicted concentrations.

III. DESCRIPTION OF THE VALLEY MODEL

The model used to estimate short-term concentrations for plants located in severe terrain is one developed previously by EPA for application to sources

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* Turner, D. B., "Workbook of Atmospheric Dispersion Estimates," U. S. Department of Health, Education, and Welfare, PHS Publication No. 999-AP-25 (Rev. 1970).

located in complex terrain (valley model). Elevations of the receptor sites are derived from contours on the U.S.G.S. quadrangle maps of the area. The model calculates a daily average concentration at these receptor locations based on a 10 meter nearest-approach point of the plume and an assumed persistence of meteorological conditions for 6 hours out of the 24 hours. During this period, the wind direction azimuth is considered to be confined to a 22.5 degree sector. This model assumes a stability class "E" (stable) and a wind speed of 2.5 m/sec.

More detailed descriptions of the three models are given in the AQCR reports written by GEOMET, Incorporated.

Appendix C

FORMS OF TABLES USED IN INDIVIDUAL AQCR REPORTS

Table 3. Maximum Ground Level Concentrations of SO_2[a]

Plant	Maximum 24-Hr. Concentration ($\mu g/m^3$)		Maximum Annual Concentration ($\mu g/m^3$)
	Nominal Load	Maximum Load[b]	

[a] Estimated maximum concentrations based upon 1972 operations.

[b] Based on operation at 95% of rated capacity and the addition of a 10% safety factor to the computed concentration.

Table 4. SO_2 Emissions and Basis for Maximum Concentration Day

Plant	Principal Fuels	% Sulfur	Nominal Load Case		Maximum Load Case	
			Amount Fuel[a]	SO_2 Emissions Tons/Day	Amount Fuel[a]	SO_2 Emissions Tons/Day

[a] Coal, 10^3 tons/day; Oil, 10^3 gals/day; Gas, 10^6 CF/day.

Table 5. χ/Q Relationships for Plants

Plant	Maximum Concentration Day $\frac{\chi}{Q}$, $\frac{\mu g/m^3}{g/sec}$		Maximum Annual Concentration $\frac{\chi}{Q}$, $\frac{\mu g/m^3}{g/sec}$
	Nominal Load	Maximum Load	

Plant (Company)	Stack No.	Rated Capacity (10^6 J/sec)	Stack		Nominal Load Operations				Maximum Load Operations		
					Stack Exit		SO_2 Emissions[a] (g/sec)	Plant Variation Factors[c]	Stack Exit		SO_2 Emissions[b] (g/sec)
			Height (m)	Diam. (m)	Velocity (m/sec)	Temp. (°K)			Velocity (m/sec)	Temp. (°K)	

a. Based on annual average operations.

b. Based on plant operating at 95% of capacity.

c. The underlined value corresponds to the month of the maximum concentration day. The factors are listed chronologically, starting with January.

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